



Dart Aerospace Ltd.
1270 Aberdeen St
Hawkesbury, ON
K6A 1K7
Canada

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2

D407-667-205TRN
Job Sheet 196709



Part No: D407-667-205TRN

Job Qty: 1 pcs

Part Name: Crosstube Turning Detail



Part Weight: 0 lbs

Status: New

Priority: Medium

Job Created: 6/20/19

Job Tracking No:

Created By: Marie Lajeunesse

Due Date: 7/4/19

Description:

Note: DWG REV G IPP Rev:A 08-03-06 new issue DD verified by:ec IPP Rev B 08.04.02 Removed polish EC
verified by: DD IPP Rev:C 08-08-19 revE as per dwg DD verified by:EC

Ship Via:

Bill of Materials

Job Routing

Op No	Operation	Qty	Start Date	Due Date	Standard		Workcenter/Supplier		Lead Time	DAS Sign-off
					Setup Hrs	Run Hrs	Workcenter / Supplier			
100	Mori Seiki TL-40 - 1	1 pcs	7/4/19	7/4/19	1.00	3.13	Mori Seiki TL-40 - 1			662019-07-10 9-89
110	QC 2	1 pcs	7/4/19	7/4/19	0.00	0.00	QC 2 - 1			
							QC 2 - 12			
							QC 2 - 14			
							QC 2 - 17			
							QC 2 - 19			
							QC 2 - 2			
							QC 2 - 20			
							QC 2 - 22			
							QC 2 - 23			
							QC 2 - 25			
							QC 2 - 32			
							QC 2 - 33			
							QC 2 - 35			
							QC 2 - 39			
							QC 2 - 4			
							QC 2 - 40			
							QC 2 - 44			
							QC 2 - 45			
							QC 2 - 48			
							QC 2 - 49			
							QC 2 - 50			
							QC 2 - 51			
							QC 2 - 52			
							QC 2 - 57			
							QC 2 - 62			
							QC 2 - 63			
							QC 2 - 8			DAS 662019-07-10 9-89
							QC 2 - 66			
							QC 2 - 64			

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				QC 2 - 65		
				QC 2 - 5		
				QC 2 - 71		
				QC 2 - 73		
				QC 2 - 69	DAS	
120	Mori Selki TL-40 - 1 - B4B	1 pcs	7/4/19	1.00 3.13	Mori Selki TL-40 - 1 - B4B	662019-07-11
130	QC 2	1 pcs	7/4/19	0.00 0.00	QC 2 - 1	9-89
				QC 2 - 12		
				QC 2 - 14		
				QC 2 - 17		
				QC 2 - 19		
				QC 2 - 2		
				QC 2 - 20		
				QC 2 - 22		
				QC 2 - 23		
				QC 2 - 25		
				QC 2 - 32		
				QC 2 - 33		
				QC 2 - 35		
				QC 2 - 39		
				QC 2 - 4		
				QC 2 - 40		
				QC 2 - 44		
				QC 2 - 45		
				QC 2 - 48		
				QC 2 - 49		
				QC 2 - 50		
				QC 2 - 51		
				QC 2 - 52		
				QC 2 - 57		
				QC 2 - 62		
				QC 2 - 63		
				QC 2 - 8	DAS	
				QC 2 - 66	662019-07-15	
				QC 2 - 64	9-89	
				QC 2 - 65		
				QC 2 - 5		
				QC 2 - 71		
				QC 2 - 73		
				QC 2 - 69		
140	QC 8	1 pcs	7/4/19	0.00 0.00	QC 8 - 12	
				QC 8 - 14		
				QC 8 - 17		
				QC 8 - 20		
				QC 8 - 25		
				QC 8 - 3		
				QC 8 - 32		
				QC 8 - 33		
				QC 8 - 35		
				QC 8 - 39		
				QC 8 - 4		
				QC 8 - 44		
				QC 8 - 45		
				QC 8 - 49		
				QC 8 - 58		
				QC 8 - 8		
				QC 8 - 9		
				QC 8 - 68		
				QC 8 - 67	6619-07-15	
				Plex 6/20/19 7:38 AM Dart.lajeunesse.marie		

					QC 8 - 1 (A)	
					QC 8 - 47	
					QC 8 - 40	
					QC 8 - 52	
					QC 8 - 23	
					QC 8 - 57	
145 Crosstubes - 2 - B4B	1 pcs	7/4/19	0.00 0.65		Crosstubes - 1 - B4B	BS 7/29/2019
					Crosstubes - 2 - B4B	
					Crosstubes - 3 - B4B	
					Crosstubes - 4 - B4B	
150 Crosstubes - 3 - B4B	1 pcs	7/4/19	0.00 0.25	HAND FINISH	Crosstubes - 1 - B4B	JUL 30 2019
					Crosstubes - 2 - B4B	
					Crosstubes - 3 - B4B	
					Crosstubes - 4 - B4B	
160 QC 7	1 pcs	7/4/19	0.00 0.00		QC 7 - 10	
					QC 7 - 13	
					QC 7 - 14	
					QC 7 - 15	
					QC 7 - 17	
					QC 7 - 18	
					QC 7 - 19	
					QC 7 - 2	
					QC 7 - 28	
					QC 7 - 3	
					QC 7 - 30	
					QC 7 - 34	
					QC 7 - 36	
					QC 7 - 37	
					QC 7 - 41	
					QC 7 - 47	NW 19-08-29
					QC 7 - 48	
					QC 7 - 51	
					QC 7 - 58	
					QC 7 - 59	
					QC 7 - 60	
					QC 7 - 9	
					QC 7 - 68	
					QC 7 - 50	
					QC 7 - 67	
					QC 7 - 40	
					QC 7 - 24	
					QC 7 - 43	
170 Packaging 3-1 - Stock - B4B	1 pcs	7/4/19	0.00 0.00		Packaging 3 - 1 - B4B	
					Packaging 3 - 2 - B4B	
					Packaging 3 - 3 - B4B	
					Packaging 3 - 4 - B4B	
					Packaging 3 - 5 - B4B	
					Packaging 3 - 6 - B4B	
					Packaging 3 - 7 - B4B	
					Packaging 3 - 8 - B4B	
					Packaging 3 - 9 - B4B	
					Packaging 3 - 10 - B4B	
					Packaging 3 - 11 - B4B	
					Packaging 3 - 12 - B4B	
					Packaging 3 - 13 - B4B	
					Packaging 3 - 14 - B4B	
					Packaging 3 - 15 - B4B	
					Packaging 3 - 16 - B4B	
					Packaging 3 - 17 - B4B	

					Packaging 3 - 18 - B4B	
					Packaging 3 - 19 - B4B	
					Packaging 3 - 20 - B4B	
					Packaging 3 - 21 - B4B	
					Packaging 3 - 22 - B4B	
					Packaging 3 - 23 - B4B	
					Packaging 3 - 24 - B4B	BIB 8/27/2019
					Packaging 3 - 25 - B4B	
					Packaging 3 - 26 - B4B	
					Packaging 3 - 27 - B4B	
					Packaging 3 - 28 - B4B	
					Packaging 3 - 29 - B4B	
					Packaging 3 - 30 - B4B	
					Packaging 3 - 31 - B4B	
					Packaging 3 - 32 - B4B	
					Packaging 3 - 33 - B4B	
					Packaging 3 - 34 - B4B	
					Packaging 3 - 35 - B4B	
					Packaging 3 - 36 - B4B	
180 QC 21 - SA	1 pcs	7/4/19	0.00 0.00		QC 21 - SA - 21	AUG 27 2019
					QC 21 - SA - 70	
					QC 21 - SA - 53	

Part Op 100 - Mori Seiki CNC Lathe Large) 1-Fill tube with sand & install plugs DT8531 on both ends as per Folio FA248 3-Turn
Descriptions: first side as per Folio FA248
110 - (QC2- Inspect parts off machine FAI/FAIB)
120 - (Mori Seiki CNC Lathe Large) 1-Turn second side as per Folio FA248 4-Scribe part # and batch # using vibrating stylus as per Dwg D407-667-245
130 - (QC2- Inspect parts off machine FAI/FAIB)
140 - (QC8- Inspect parts - second check)
145 - (Crosstubes) Grind off circumferential machining marks longitudinally.
150 - (Crosstubes) 1- handfinish X-TUBE INSIDE AND OUT 2- ACID ETCH X-TUBE INSIDE AND OUT. USE RED SCOTCH BRITE
160 - (QC7-Inspect Chemical Conversion Coat)
170 - Identify and stock in kanban rack
180 - (QC21- Final Inspection - Work Order Release)

Job BOM

Part / Item	Component Name	Quantity	Operation	Container
D6011-115	Crosstube Material	1 pcs (1 ea)	100-Mori Seiki TL-40 - 1	SC006659

Job Allocations

Operation	Component Part	Required	Inventory	Allocated
100-Mori Seiki TL-40 - 1	D6011-115	1	54	0

Part Specifications

Specifications could not be found.

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DART
AEROSPACE
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CANADA
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Email: sales@dartaero.com
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Container No: S197111

Part: D407-667-205TRN
Job No: 196709
Serial No/Batch: S197111
Revision: G
Inspector:
Exp Date:
Instructions:
Date: 07/10/19

②

DART AEROSPACE LTD	Work Order: 196709	
Description: Crosstube Assembly	Part Number: D407-667-245	
Inspection Dwg: D407-667-245 Rev: G		Page 1 of 2

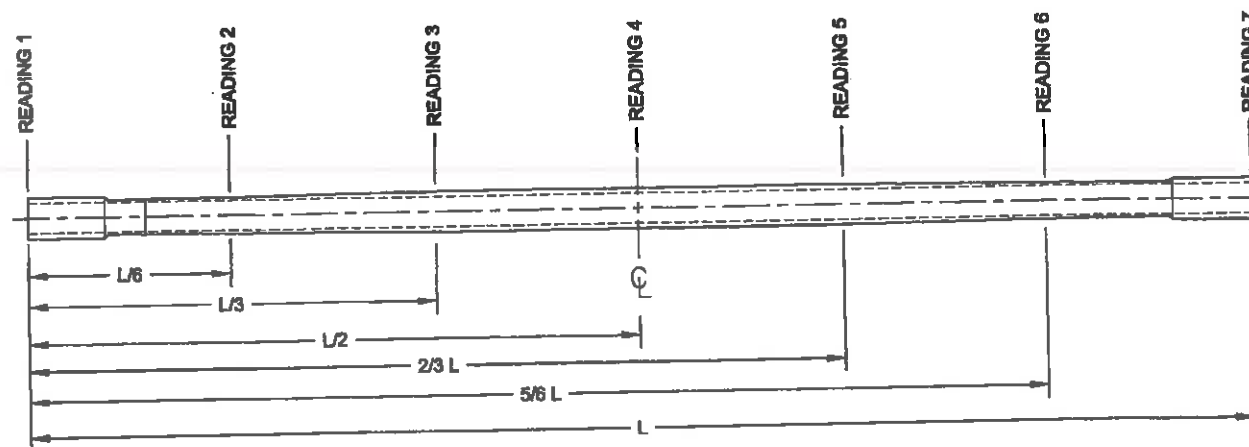
FIRST ARTICLE INSPECTION CHECKLIST

	Inspection Sheet Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.490	+0.005/-0.000	2.492	✓		CNC-04	
	1.832	+0.005/-0.000	1.836	✓		CNC-08	
	1.838	+0.005/-0.000	1.843	✓		↓	
	1.892	+0.005/-0.000	1.897	✓			
	2.052	+0.005/-0.000	2.057	✓		CNC-04	
	2.206	+0.005/-0.000	2.211	✓		↓	
	2.521	+0.005/-0.000	2.526	✓		↓	
	2.633	+0.005/-0.000	2.638	✓			
	4.10	+/-0.030	4.10	✓		CNC-08	
	4.978	+/-0.030	4.981	✓		↓	
	2.040	+0.000/-0.010	2.038	✓		↓	
	0.125	+/-0.010	.119	✓			
	R0.063	+/-0.010	.063	✓		RG	
	R0.500	+/-0.010	.500	✓		"	
	2.490	+0.005/-0.000	2.491	✓		CNC-04	
SIDE B	1.832	+0.005/-0.000	1.836	✓		CNC-08	
	1.838	+0.005/-0.000	1.843	✓		↓	
	1.892	+0.005/-0.000	1.897	✓			
	2.052	+0.005/-0.000	2.057	✓		CNC-04	
	2.206	+0.005/-0.000	2.211	✓		↓	
	2.521	+0.005/-0.000	2.526	✓		↓	
	2.633	+0.005/-0.000	2.638	✓			
	4.10	+/-0.030	4.10	✓		CNC-08	
	4.978	+/-0.030	4.985	✓		↓	
	2.040	+0.000/-0.010	2.038	✓		↓	
	0.125	+/-0.010	.125	✓			
	R0.063	+/-0.010	.063	✓		RG	
	R0.500	+/-0.010	.500	✓		"	
	112.91	+/-0.020	112.92	✓		Tape	

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DART AEROSPACE LTD		Work Order: 196705
Description: Crosstube Assembly		Part Number: D407-667-245
Inspection Dwg: D407-667-245 Rev: G		Page 2 of 2

WALL THICKNESS MEASUREMENT



Location	WALL THICKNESS MEASUREMENT (IN)				Deviation Δw (max-min)	TOLERANCE
	w1	w2	w3	w4		
READING 1 L= 0"	.217	.224	.220	.217	.007	0.075"
READING 2 L=18.82	.248	.238	.220	.234	.028	
READING 3 L=37.64	.434	.404	.388	.415	.046	
READING 4 L=56.46	.660	.655	.618	.630	.042	
READING 5 L=75.27	.448	.407	.380	.394	.068	
READING 6 L=94.09	.257	.253	.217	.219	.040	
READING 7 L=112.91	.218	.222	.219	.216	.006	

Calibration Result

Actual Block Thickness: 100-750

Sitescan 250 Measured Thickness: 100-750

Measured by: DAS 66 9-89	Audited by: DAS 67 9-89	Preliminary Approval:
Date: 2019-07-15	Date: 19-07-15	Date:

Rev	Date	Change	Revised by	Approved
A	04.04.21	New Issue (P/O D407-667-205)	KJ/RF	
B	06.03.09	Dwg Rev updated	KJ/JLM	
C	06.03.30	Tolerance revised for 4.978 dimension	KJ/JLM	
D	07.02.19	Dwg Rev updated	KJ/JLM	
E	09.05.20	Dwg Rev updated	KJ	
F	12.06.04	Wall thickness form added	KJ	
G	15.05.14	Dwg Rev updated	KJ	

Item	QTY	PART NUMBER	DESCRIPTION
	-246		
	X	D407-687-246	CROSSTUBE ASSEMBLY (407 HIGH AFT)
1	1	D6011-115	CROSSTUBE
2	2	D2873-043	NUT PLATE
3	2	D2873-045	NUT PLATE
4	1	D2894-1	SUPPORT
5	2	D3190-1	CHAFING SHIELD
6	2	D3566-083-430	RUBBER CUSHION
7	14	MS20801AD4W8	RIVET (OR NAS9302B-4-8)
8	4	MS21920-22	CLAMP
9	2	MS21920-25	CLAMP (OR MS21920-2A)
10	AR	SCOTCH-WELD DP460	EPOXY ADHESIVE, 3M SCOTCH-WELD
11	AR	PROSEAL 880	SEALANT

GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6011-115
- 2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT CROSSTUBE PER DART QSI 005 4.2
FOR HATCHED AREAS (ZN A9-2), MASK AS REQUIRED
TO APPLY PRIME AND APPLY CLEAR COAT ONLY
- 3) TOLERANCES: USE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: SCRIBE DART PART NUMBER "D407-687-246" AND BATCH NUMBER ON DP460 PER QSI 016. LET CURE FOR 24 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- 7) WEIGHT: 27.7 LB
- 8) PART IS SYMMETRIC ABOUT CENTERLINE.
- 9) RUN-OFF PART: BLEND OUT EDGE LONGITUDINALLY. TRANSITION SHOULD BE SMOOTH.
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- 11) LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038.
- 12) INSTALL D2894-1 CENTER SUPPORT USING A 0.04" TO 0.07" THICK LAYER OF SCOTCH-WELD DP460 PER QSI 016. LET CURE FOR 24 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- 13) INSTALL MS21920-25 CLAMPS WITH D3566-083-430 RUBBER CUSHIONS TO SECURE D2894-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE OPPOSITE CROSSTUBE SUPPORT.
- NOTE: MS21920-24 CLAMPS CAN BE USED TO ACCOMMODATE VARYING DIAMETERS. ENSURE THERE IS A MINIMUM OF 1.5 THREADS IN SAFETY ON THE NUTS.
- 14) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
- 15) APPLY A THIN COAT OF PROSEAL 880 ON INSIDE CONCAVE SURFACE OF D3190-1 CHAFING SHIELDS AND LET CURE PER MANUFACTURER'S INSTRUCTIONS. INSTALL PROSEAL D3190-1 CHAFING SHIELDS ONTO CROSSTUBE BY APPLYING A THIN COAT OF PROSEAL 880 ONTO CROSSTUBE. BE SURE TO ELIMINATE ANY AIR GAPS.
- 16) INSTALL D3190-1 CHAFING SHIELDS SO THAT OVERLAP IS 90 TO 70 DEGREES FROM BOTTOM OF CROSSTUBE OPPOSITE D2894-1 SUPPORT.
- 17) TORQUE CLAMPS 80 TO 100 IN-LB. TORQUE CLAMPS ON D3190-1 CHAFING SHIELD 40 TO 60 IN-LB. ENSURE AT LEAST 1.5 T-READS ARE SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING. PRIOR TO PACKAGING, RE-CHECK TORQUE ON CLAMPS AFTER ADHESIVE HAS CURED FOR 24 HOURS.

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SUBJECT TO AMENDMENT
WITHOUT NOTICE
WORK ORDER
NO. 196709 MJS
1906-2d

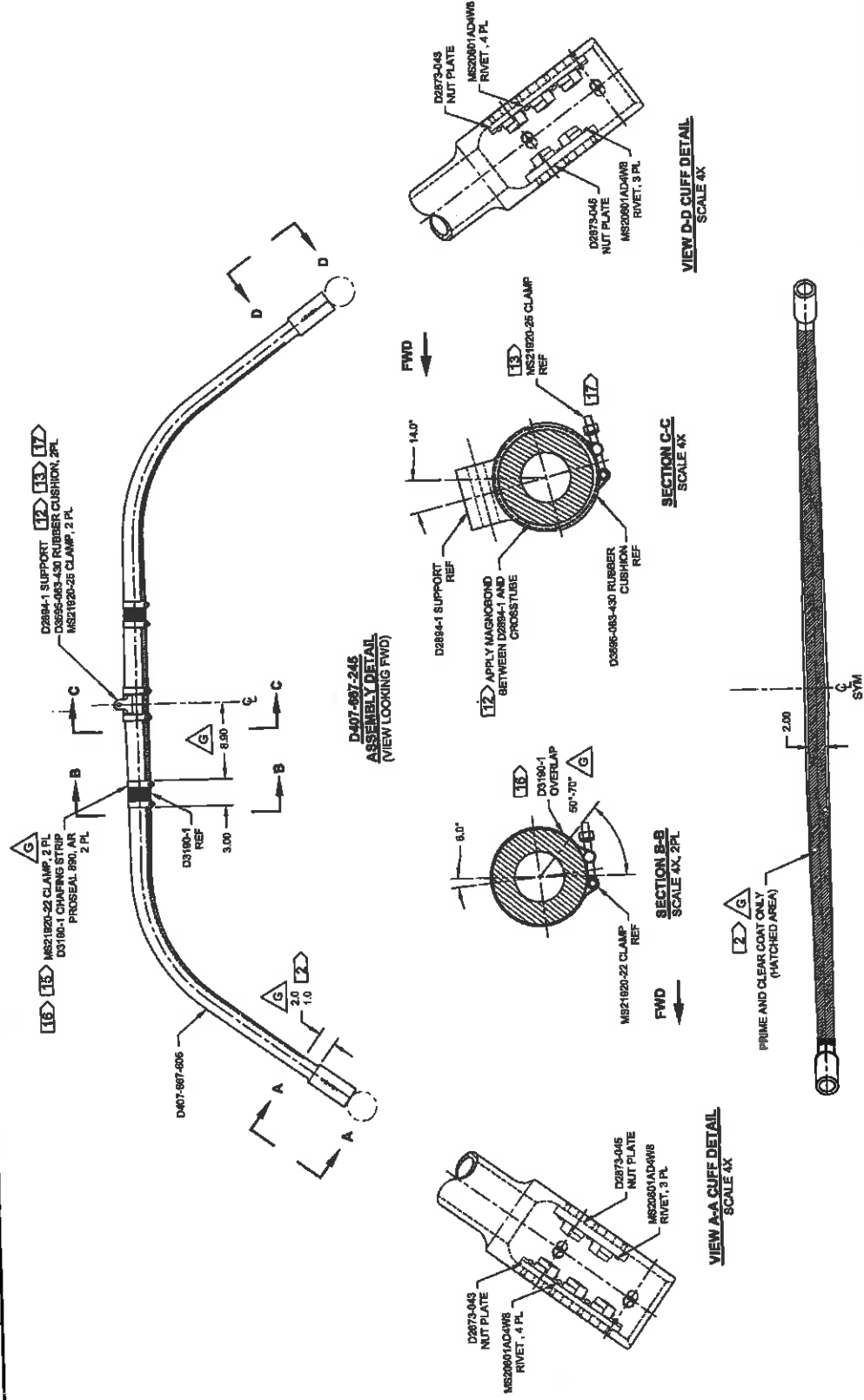
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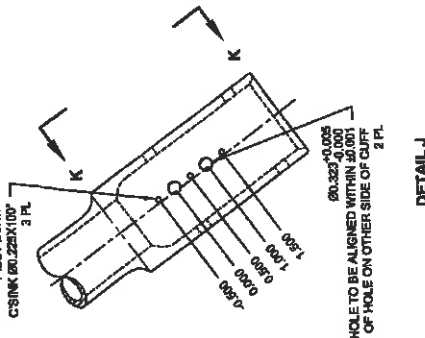
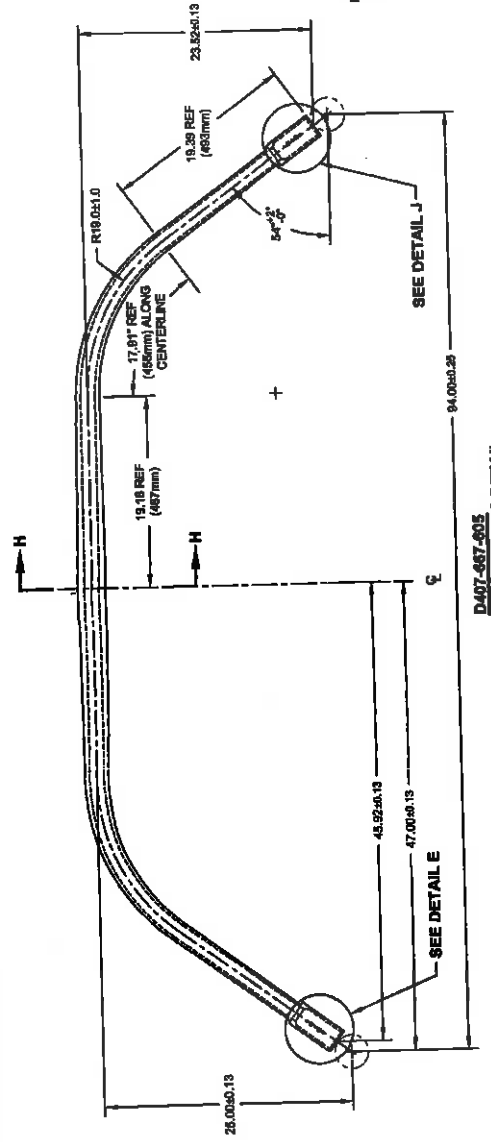
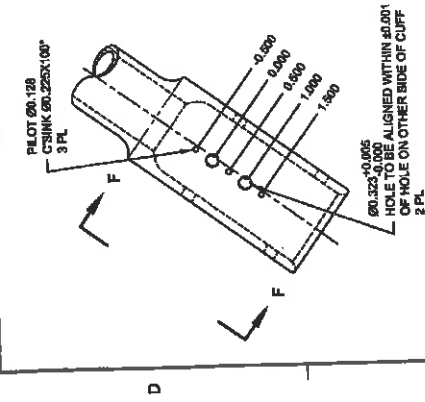
G	INCOMP. DEOS D407-687-246-F1/F2 (ZN D5-1, A5-1, D5-2, B5-2, C5-2; 8.90 WAS 8.58 (ZN D5-2); TORQUE REDUCED FOR CHAFING SHIELD (ZN A5-1); FINISH REVISED TO ALLOW MANUFAC. FLEXIBILITY (ZN C5-1); REFORMAT NOTES TO NEW STANDARDS (ZN B5-1); RELOCATED FLAG # 8 (ZN A5-3) PER NCR 270; REMOVED REF. & ADD TOLERANCES (ZN C5-3, C4-3 & D2-3)	RF	16.03.20
F	REFORMAT NOTES TO NEW STANDARDS (ZN B5-1); RELOCATED FLAG # 8 (ZN A5-3) PER NCR 270; REMOVED REF. & ADD TOLERANCES (ZN C5-3, C4-3 & D2-3)	RF	08.11.08
E	8.02 AND 8.53 WERE 8.40 AND 8.90 (ZN D5-2); REFORMATTED VIEWS AND REFORMATTED DRAWING TO CURRENT STANDARDS.	MB	08.07.24
D	RELOCATED CLAMPS MOVED 0.375 TOWARD Q.L. TO ELIMINATE INTERFERENCE WITH AIRCRAFT MOUNTS. REFERENCE: PAR808-21 AND ECN41235	PH	07.02.07
C	ADD VIEW FOR OEM SKID HOLES, ROTATE ORIENTATION OF CLAMPS SECTION F-1, REMOVE -851 ABRASION STRIP, ADD MAGNEBOND 6889, ADD CUSHION	PH	06.07.26
B	ADD HOLES AND NUT PLATES FOR COMPATIBILITY WITH BHT/AA SKIDTUBES	CP	03.05.21
A	ADD CHAFING SHIELD	CP	02.05.13
REV.	NEW ISSUE	BY	DATE
DESIGN	77	DESCRIPTION	
DRAWN	RF	DART AEROSPACE LTD	
CHECKED	77	HAWKESBURY, ONTARIO, CANADA	
MFG. APPR.	77	DRAWING NO.	REV. G
DE APPR.	77	D407-687-246	SHEET 1 OF 4
DATE	15.03.20	TITLE	SCALE
		CROSSTUBE ASSY (407 HIGH AFT)	NTS

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DESIGN	RF	DART AEROSPACE LTD HAMKESBURY, ONTARIO, CANADA
DRAWN	RF	DRAWING NO. D407-687-246
CHECKED	RF	REV. G
MFG. APPR.	RF	SHEET 2 OF 4
APPROVED	RF	TITLE CROSSTUBE ASSY (407 HIGH AFT)
DE APPR.	RF	SCALE NTS
DATE	15.03.20	NTS

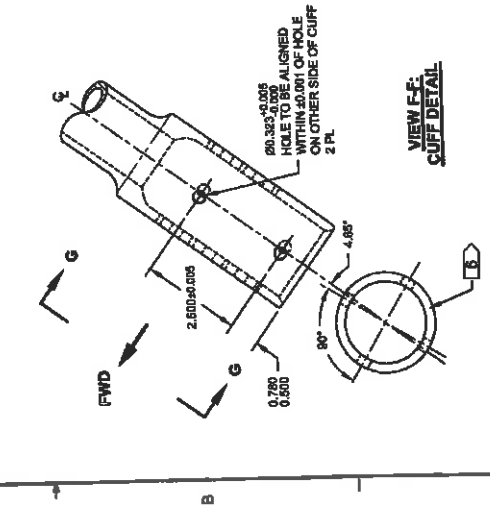
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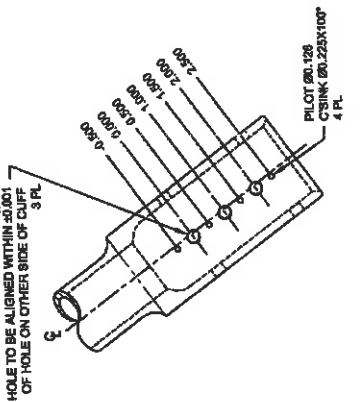
DETAIL E
SCALE 4X
(VIEW LOOKING FWD)

D407-487-405
BENDING AND DRILLING DETAIL
(VIEW LOOKING FWD)

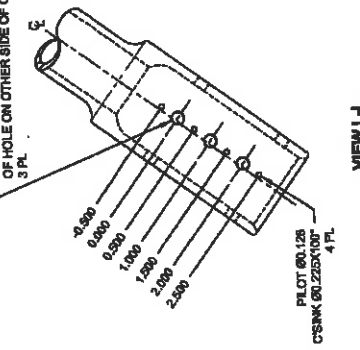
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SCALE 4X
(VIEW LOOKING FWD)



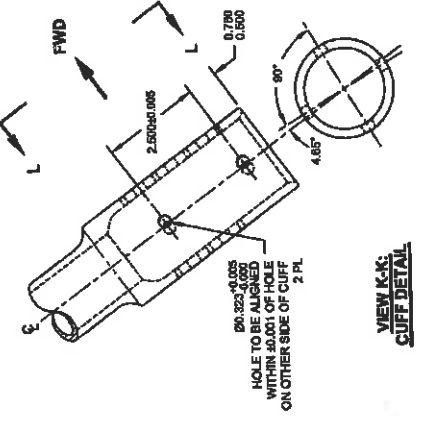
VIEW F-F:
CUFF DETAIL



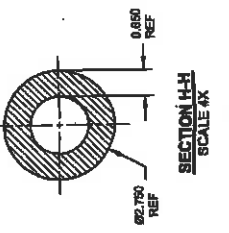
VIEW G-G
(VIEW LOOKING AFT, ROTATED)



VIEW L-L
(VIEW LOOKING AFT, ROTATED)



VIEW K-K:
CUFF DETAIL



SECTION H-H
SCALE 4X

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2015 APR 09 47

DESIGN	RF	DART AEROSPACE LTD HAMMERSBURY, ONTARIO, CANADA
DRAWN	RF	DRAWING NO. REV. G
CHECKED	RF	SHEET 3 OF 4
MFG. APPR.	RF	TITLE SCALE
DE APPR.	RF	CROSSTUBE ASSY (407 HIGH AFT) NTS
DATE	15.03.20	COPYRIGHT © 2002 BY DART AEROSPACE LTD ALL RIGHTS RESERVED. NO PART OF THIS DOCUMENT IS TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.

Entered: _____ Date: _____

WORK ORDER NON-CONFORMANCE / ROUTE UPDATE



Route update only ☐

NCR No. _____

Job: _____

Part No. _____

DISPOSITION

Rework ☐
Scrap ☐
Use-as-is ☐

DEPARTMENT/PROCESS

Skid-tube ☐
Machining ☐
Large Fab ☐

Cross tube ☐
Small Fab ☐
Finishing ☐

Engineering ☐
Water Jet ☐
Supplier ☐
Quality ☐

Date :

Sequence #:

QTY Affected :

MIRB (QSI042)

Description Work Order Deviation

Disposition

Completed By

Lead hand / Supervisor

QC / QA Coordinator

Root Cause

Operator ☐
Manufacturing Process ☐
Equip/Tooling ☐
Handling/Preservation ☐
Material ☐
Product Improvement ☐
Process Improvement ☐
Human Factors ☐

FAULT CATEGORY

Pressure/Forced ☐
Bending ☐
Crushing ☐
Cracks ☐
Crimp/Kink/Ripple/Wave/Twist ☐
Marks/Chatter ☐
Mislabeled ☐
Other/Details: ☐

Contamination ☐
Misaligned/off center ☐
BOM/Route ☐
Broken/Damage/Defect ☐
Incomplete/Unclear Instructions ☐
Drill Holes ☐
Fit/Function ☐

Power Loss/Surge ☐
Folio/Program ☐
Grain Direction ☐
Weld ☐
Wrong Stock Pulled ☐
Out of Sequence ☐
Off-set/Set-up ☐

Positioned Wrong ☐
Outside Tolerance ☐
Drawing ☐
Finish ☐
Part Lost/Missing ☐
Misread ☐